Medical Progress in a Remote Archipelago

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Just how long has the lag been in local acceptance of medical progress? Five major innovations are examined: vaccination, anesthesia, antiseptic and aseptic surgery, x-rays, and antibiotics. Hawaii has not always been in the forefront of medical progress, but generally has been quick to adopt new treatments and technologies.

Mainland observers, and even some island residents, have sometimes assumed that Hawaii has been slow to adopt innovations originating elsewhere. Late 19th century writers, for example, often expressed surprise on finding Honolulu to be a modern metropolis with telephone service and electric lights. Hollywood films of the 1920s and 1930s typically portrayed modern Hawaii as a backward land of thatched huts, happy plantation workers, and compliant sarong-clad Polynesian maidens. More recently, local economists have argued over the duration of time lags between national business cycles and their Island echoes. And a 1994 Congressional candidate peevishly blasted Hawaii's voters for being out of step with Mainland political trends. Such assumed laggardly tendencies have usually been attributed to geographic remoteness, compounded by a lotus-eating *Polynesian paralysis* and cultural insularity.

Given these stereotypes, medical historians might conceivably ask: Have medical advances been similarly slow to reach Island practitioners? Just how long has the lag been in local acceptance of medical progress?

In an effort to answer these questions, five major innovations are considered: vaccination, anesthesia, antiseptic and aseptic surgery, x-rays, and the antibiotics and other *miracle drugs*. All five of these developments, of course, are now more than 50 years old, and thus offer little insight into Hawaii's current adaptability to medical progress. A different selection of examples, moreover, might lead to somewhat different conclusions. Even so, the following analysis might tell modern medical people something about their predecessors' willingness to accept advances in their own time.

Vaccination

Vaccination with cowpox matter in order to induce immunity to smallpox was first tried by English physician Edward Jenner in 1796. Direct inoculation with the disease, or variolation, had been in use for the same purpose for centuries, but had proven to be extremely risky. Jenner published his results in June 1798. Vaccination grew in popularity both in Europe and the United States throughout the 19th century, but smallpox remained a major cause of death for many years, especially in underdeveloped areas.[1-2]

In Hawaii, the earliest known vaccination attempts were those made by Dr Abraham Blatchely, a physician who served with the Sandwich Islands Mission from April 1823 to November 1826. According to Halford:

> Dr Blatchley found no smallpox in Hawaii, yet his wonder and relief were tinged by fear of the devastation inevitable when the scourge should come from one of the innumerable infected ports. Apparently he had requested the Boston Board to forward a stock of vaccine to him at Honolulu as soon as it could be obtained from London's inoculation hospital, sole source of the world's supply. It consisted of Woodville's arm-to-arm achievement of a complex vaccine fairly free from ulcerative termination...

Results were disappointing to Dr Blatchely, and he wrote to the Boston Board: "I regret that the vaccine injection sent by Capt Gardiner of Nantucket was too old—by the date of it about 18 months old before he sailed...It was good for nothing."[3]

Notwithstanding this initial failure, vaccination appears to have become an established procedure by 1839, when the next known historical reference to it occurred. In early June of that year, Richard Brinsley Hinds, the surgeon of the visiting British ship *Sulphur*, observed crowds of Hawaiians—"the old and the young, the chiefs of rank and the humble *kanaka*"—regularly assembled at the door of Dr T.C.B. Rooke to be vaccinated following a smallpox scare. "Eight or ten thousand have been vaccinated at Honolulu," reported Hinds.[4-5] This was apparently Hawaii's first mass immunization effort.

Vaccination efforts continued sporadically throughout the 1840s, although their effect was seemingly limited. Physicians involved in these efforts included Judd in 1841, Baldwin in 1842, and Lathrop and Wetmore in 1849.[6-9] When the inevitable epidemic finally struck, however—the first case was reported May 13, 1853, and the last January 14, 1854—fully 11,081 cases and 5,947 deaths occurred on Oahu alone, with another 887 cases and 448 deaths on the Neighbor Islands. As noted by Greer, "the widespread incidence of smallpox in 1853 proves either that immunization figures were grossly exaggerated, or that the process was ineffective for one reason or another, or both." [10-11]

In this example at least, medical progress was indeed slow to reach Hawaii: at least a quarter of a century elapsed between Jenner's 1798 report and Blatchley's ill-fated effort to secure vaccine, and more than 40 years between Jenner's announcement and the 1839 immunization push by Dr Rooke and his colleagues. Even so, it should be remembered that no trained foreign doctor lived in the Islands before 1811; any earlier adoption of vaccination would thus have been extremely unlikely.[1]

Anesthesia

Anesthesia was first used in surgery in the early and middle 1840s. In January 1842, William E. Clarke, a chemistry student of Rochester, New York, administered ether to a young woman for extraction of a tooth by a dentist, but failed to follow-up on the procedure. Two months later, on March 30, 1842, Crawford W. Long, a practitioner in Jefferson, Georgia, first used ether as a general

anesthetic for surgery, and repeated his experiment four or five times during the next four years; but he did not publicize this until 1849. Horace Wells, a dentist in Hartford, Connecticut, had one of his own teeth extracted under nitrous oxide, and after further trials gave a demonstration (deemed a failure) at Massachusetts General Hospital in January 1845. Finally, on October 16, 1846, William T.G. Morton, another dentist, demonstrated the application of ether as a general anesthetic for excising a tumor of the neck in an operation performed by Dr John C. Warren at the same hospital. Singer and Underwood conclude that "for practical purposes he [Morton] must be considered the discoverer of anaesthesia."[13] Add Bordley and Harvey: "Within a few months of this highly successful and thoroughly convincing demonstration, Morton's method was being used throughout the Western world to make possible surgical and obstetrical procedures which previously could not have been undertaken."[14]

The news of this breakthrough reached Honolulu late in August 1847 and promptly appeared as brief undated items in two local papers. Quoting the Boston *Journal*, *The Friend* said "Dr Morton, Dentist, No 19, Tremont Row, at the invitation of Dr Haywood, visited the McLean Hospital and administered his preparation to produce sleep, to a person about to undergo the operation of the extraction of a tumor from the neck." An almost identical note was carried two days later by *The Polynesian*.[15-16]

Ether was not unknown in Hawaii at this time. In 1845, James Smith, the Mission's doctor at Koloa, Kauai since 1842, complained of the poor condition of the medicines he had received, noting that "a bottle of Either" [sic] was poorly corked and its contents lost.[17] Dr Smith might have intended using the ether to treat pulmonary tuberculosis, as was commonly done at the time.[18]

The earliest known reference to the use of general anesthesia in Hawaii did not enter the record until February 16, 1850, when Dr Charles H. Wetmore, the Mission physician in Hilo, administered ether to his wife, Lucy, as she was giving birth to their first child. Dr Wetmore's subsequent account of this delivery was addressed to Dr Dwight Baldwin on Maui, establishing the date of this notable introduction to Island medicine. His casual reference to the anesthetic moreover suggests that its use was already known in Hawaii by that time.[19]

No similarly early record has come to light regarding the use of anesthetics in dental surgery in the kingdom. The first such reference seems to have been Isabella Lyman's 1868 journal entry reporting the extraction of a tooth: "He [the doctor] used the ether spray and they say I fainted after it." Since this event likewise occurred in Hilo, the doctor referred to was probably again Dr Wetmore.[20] Most likely, dental anesthesia was already common in the Islands by 1868, and earlier usage simply went unrecorded.

Given the slowness of transpacific communication in the middle of the 19th century, the first reported instance of anesthesia in Hawaii's medical history, more than three years after Morton's demonstration in Boston, does not seem unduly delayed.

Antiseptic and Aseptic Surgery

Antiseptic surgery had its origins in the work of Gordon, Semmelweis, Pasteur and Lister in the late 18th and mid 19th centuries. Alexander Gordon, an Aberdeen physician writing in 1795, contended that puerperal infection "was carried from an infected to an uninfected woman by the agency of the midwife or the doctor," and could be avoided by careful cleansing of the operator's hands and arms. A half-century later, in 1846, Ignaz Semmelweis, a Hungarian surgeon working at the General Hospital of Vienna, reduced puerperal fever deaths from 10%-30% to 1% of the pregnant women admitted by insisting on sterilization of the hands of students or physicians attending these women.[21] In 1865, Joseph Lister learned of Louis Pasteur's research on fermentation and putrefaction and, using carbolic acid, developed a systematic and successful method for achieving antisepsis in surgery. Lister's results were published in 1867. Pasteur, an outspoken proponent of the germ theory of disease underlying Lister's procedures, argued it before the French Academy of Medicine in 1878. It was proven beyond question in a paper by Robert Koch in 1879.[22-23]

Antisepsis was already popular in Europe by 1876, but it was resisted in the United States for another quarter of a century. As late as 1882, the American Surgical Association formally rejected the Lister doctrine.[24-25]

Aseptic surgery, involving the steam sterilization of instruments, sterile dressings, and rubber gloves, evolved during the last quarter of the 19th century. In the words of Bordley and Harvey, "Many American surgeons virtually bypassed the era of antisepsis but were quick to embrace the aseptic technique that began to supplant it in the 1880s." [26-27]

The germ theory, so basic to the new procedures, found ready acceptance in Hawaii. As early as 1882, at a time when the reality of germs was still hotly disputed by many U.S. physicians, a Hawaiian Board of Health report noted the role of germs in leprosy.[28] A year later, on November 8, 1883, Dr Edward Arning, described by Bushnell as "the first microbiologist in Hawaii" and "the first physician in Hawaii's history to use techniques of histopathology and microbiology in the laboratory diagnosis of infectious diseases," arrived to accept a position with the Hawaiian government.[29] An 1884 report found "parasitic germs" in Island cases of "consumption, gonorrhea and pneumonia," as well as leprosy.[30]

Historical references to the local adoption of antiseptic and aseptic surgery are much rarer, but the few so far uncovered suggest a reasonably early acceptance. In 1886, for example, Walter Murray Gibson, premier of the kingdom and president of the Board of Health, urged the building of hospitals with wards "so arranged that any one of them can be disinfected, or even torn down."[31] In 1903, Dr James Robert Judd, the first surgeon to use rubber gloves in surgery in Hawaii, began his practice in Honolulu.[32] A 1905 account of The Queen's Hospital described its "new operating-room and the facilities afforded for modern aseptic surgery."[33]

X-rays

The x-ray was discovered by Wilhelm Conrad Roentgen of the University of Wuerzburg on November 8, 1895 and announced to the press January 6, 1896. The first U.S. physician to use x-rays in his practice did so in Chicago on February 11, 1896. Thomas Edison invented the fluorescent screen by the end of March.[34-36]

Hawaii, not yet linked to the Mainland by cable or radio, first learned of Roentgen's discovery five weeks after its European announcement. Both the *Pacific Commerical Advertiser* and *Hawaiian Gazette* published somewhat breathless news items on February 11 (both misspelling Roentgen's name), followed a week later by a story in the *Bulletin*. The *Advertiser* ran a follow-up on February 14.[37-40]

Islanders had their first opportunity to see the x-ray in action on September 8, 1896, when Dr Lauschner, acting surgeon of the *SS Australia*, gave a demonstration before some 75 invited guests in Pauahi Hall, Punahou. As part of his lecture, Dr Lauschner exhibited x-ray plates he had made, and concluded his presentation by projecting first his hand and then a coin-filled purse on a fluoroscopic screen.[41]

The first institution in Hawaii with an x-ray machine was the Honolulu Sanitarium, opened at 1082 South King Street in July 1896. An account published in 1899 noted that "A fine S[t]atic electrical machine, with an x-ray attachment, is in operation, and is for the use of physicians, and for giving special electrical treatment." The Honolulu Sanitarium, a branch of the fashionable Battle Creek Sanitarium headed by J.H. Kellogg MD was meant to serve "tourists and others wishing an invigorating or tonic treatment" and "curable patients who need special or ordinary care."[42]

Acceptance of the new technique among the more established hospitals in Honolulu was reached more slowly. The earliest known reference to x-rays in the surgical records of The Queen's Medical Center describes a radiograph of the fractured leg of G.W. Kirkaldy, admitted September 6, 1904 and attended by Dr Hoffmann. Not until 1911, however, did The Queen's Hospital install its own x-ray apparatus. Leahi Home, the hospital for tuberculosis patients founded in 1900, purchased its first x-ray equipment in 1916.[43-45]

Antibiotics

The first of the major antibiotics was penicillin, identified by Sir Alexander Fleming in August or September 1928 and described by him in a paper published in 1929. Demonstrated in 1940 to have therapeutic powers, it received its first clinical trials in February 1941. Production remained inadequate until 1944, however.[46-47]

Sulfanilamide, while not actually an antibiotic, was viewed as the first of the so-called *miracle drugs*. Discovered (as a dye) in 1908, it was found in 1932 to have useful medical properties. Beginning in 1935, it became an extremely popular drug, often applied indiscriminately and sometimes recklessly for a wide variety of conditions.[48-50]

Sulfanilimide was first used locally in 1937 by Board of Health, Queen's Hospital, and Navy physicians, primarily in the treatment of gonorrhea. Four years later, on December 7, 1941, many U.S. service personnel seriously wounded in Japan's attack on Pearl Harbor were reportedly saved by sulfanilimide in what was described as its "first big wartime test."[51-55]

Penicillin reached Hawaii in 1943 but was initially restricted to military personnel. The first Island use of this antibiotic appears to have been at Aiea Naval Hospital, where it was applied with great success in the treatment of gonorrhea, beginning in July 1943. Early in October, officials decided to undertake the production of penicillin locally at the HSPA Experiment Station on Keeaumoku Street. Soon the HSPA technicians developed a new method which produced penicillin solution in quantity in half the time required by the complex 10-day process used for preparing pure penicillin. This output went largely to the plantation hospitals.[56-60]

Penicillin was first made generally available for civilian use in June 1944, with designation of The Queen's Hospital as the distributing center of the drug for civilian purposes throughout the territory. A few months later, Dr Nils Larsen described the treatment of some local cases. Between July 1944 and March 15, 1945, 1,049 patients received 774.8 million units under this program.[61-66]

Streptomycin was first isolated in 1943 and announced in medical journals early in 1946. Although limited supplies of the drug began to reach Hawaii soon afterward, the first large commercial shipment was not received until November 1946. In December, physicians at Leahi Hospital began using streptomycin on tuberculosis patients.[67-70]

Are We Laggards?

Just how far behind the times has Island medicine lagged? The foregoing paragraphs have reviewed the evidence for five major advances: Vaccination, anesthesia, antiseptic and aseptic surgery, x-rays, and antibiotics.

The record is admittedly mixed. In vaccination against smallpox, Hawaii's physicians proved themselves not only slow but ineffective: their best efforts could not prevent the catastrophic mortality recorded in the 1853 epidemic. Anesthesia, in contrast, reached Hawaii in a relatively short time, taking available transportation into account. Antiseptic surgery and the germ theory of disease were long resisted by the American medical establishment, and Island physicians and surgeons were probably more progressive in this area than many of their Mainland counterparts. X-ray technology, although demonstrated to Island residents within eight months of Roentgen's announcement, was relatively slow to achieve widespread adoption. Penicillin, in contrast, was quickly accepted, with Hawaii well ahead of many Mainland areas—a result of both the Islands' military importance and HSPA's initiative.[71]

The advances traced here are but a limited sample of medical innovations over the years, and in any event all of those cited date back a half century or more. A fair accounting of Hawaii's responses to progress, complete to the 1990s, would obviously require a full volume.

Hawaii in past years has not always been in the forefront of medical progress. But it has hardly deserved the intimations of medical backwardness sometimes expressed by out-of-state commentators.

One telling set of statistics: Before 1950, expectation of life at birth was lower in Hawaii than on the Mainland, but since 1950 it has exceeded the national average. Since 1970, moreover, it has been the highest of any of the 50 states.[72-73]

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